Transmittal # W204085
Attachment 1
pH Neutralization System Overview

Process waste waters generated at **Entegris** are pumped to the central pH neutralization and flow monitoring system prior to discharge. The pH of these waters is monitored, controlled, and corrected prior to discharging to the sewer system. As water is discharged from the system to drain, the pH and flow rate are permanently recorded for reporting and compliance and regulatory purposes. Below is a general description of the flow.

Wastewater from Entegris' manufacturing processes is pumped into three holding tanks, called "surge tanks", where it is stored prior to being discharged through the pH neutralization system. The process waters enter the first tank, and then flow by gravity through 3" pipes fitted with normally opened butterfly valves, to the next tank. The tanks are piped in series, with water being discharged from the third tank in the system. These tanks are equipped with 6" overflows mounted midway up the tanks. These lines are present to permit water to flow into downstream tanks rapidly if water is introduced to the first tank quickly. All tanks and their associated contents in the Surge Room are contained in a bermed area.

The level controls determine the functioning of the pumps or any alarm conditions which may exist. A level transmitter is mounted to the second tank, which is also piped up to the transfer pumps. The transmitter sends a signal to the PLC that is proportional to the water level. The transfer pump turns on at a certain level, as programmed into the system controller (PLC). There are high level switches on each of the tanks. Based on the lower level control of the last tank, the pumps pump the water from the surge system to the pH system.

The operation of the transfer pumps is controlled by the PLC. The PLC will turn the transfer pumps on or off based on water level in the surge tanks. Additionally, if any of he filters is backwashing, the transfer pumps will be inactivated to prevent excessive discharge of water to drain.

Water sensors are mounted on the floor of the surge room. In the event of a leak or rupture at one of the two surge tanks, the automatic valves between the tanks will automatically close preventing the entire contents of the tanks from leaking onto the floor. The leak must be repaired prior to putting the system back online.

Process wastewater generated is pumped from the surge tanks to the central pH neutralization and flow monitoring system prior to discharge. The pH of these waters is monitored, controlled, and corrected prior to discharge to the sewer system.

Process wastewater enters the first pH neutralization tank via a flanged inlet assembly fitted with a down spout. A mixer continuously agitates the first neutralization tank. The pH in the first neutralization tank is continuously monitored and digitally displayed

at the pH system screen of the HMI mounted to the system control panel. From this tank, water flows by gravity to the second pH neutralization tank via a flanged inlet assembly also fitted with a down spout. A mixer also continuously agitates the second neutralization tank. The pH in the second neutralization tank is continuously monitored and displayed on the pH system screen of the HMI. At the outlet of the second pH neutralization tank, a baffle has been installed which houses the effluent pH monitor. This probe monitors the pH of the waters being discharged by the system. The effluent pH reading is digitally displayed on the same screen. From this tank, water flows by gravity through a V notch weir where the discharge flow is monitored, recorded, and totalized. Water leaving the system flows through an outlet trap assembly prior to discharge. A sampling valve is mounted at the outlet of the system for sampling purposes. The digital recorder furnished with the system records the three pH readings and the flow reading.

The first tank in the system is used a rough pH adjustment tank. This tank is designed to treat major pH excursions that may occur. The chemical injection pumps for the first tank are larger, allowing for more rapid responses to pH excursions. This provides a more controlled stream to the second tank, where the final pH adjustment is performed. The second tank in the system is used as the fine pH adjustment tank and will correct any minor pH excursions.

When the pH of the process wastewater in either tank falls below the programmed set point, sodium hydroxide (25%) is injected into the appropriate tank to adjust the pH into the acceptable range. When the pH in either tank rises above the programmed set point, sulfuric acid (10%) is injected into the appropriate tank to lower the pH into the acceptable range. When the pH is between the high and low set points, no chemicals are added to either neutralization tank.

The rate of injection of neutralizing chemicals is determined by the difference between actual pH and the programmed set points in each tank. As the pH in either tank deviates further from the programmed set points, the rate of chemical injection is increased in order to correct the pH more rapidly. As the pH approaches the programmed set point, the rate of chemical injection decreases until it reaches zero at the set point value. The type of chemical injection is called direct proportional control. These settings are adjustable through the HMI.

The pH probes used with the system are industrial duty probes. They contain a measurement electrode, a reference electrode, and a temperature compensation electrode to provide the most accurate readings possible. These pH probes are maintained and calibrated regularly. Each probe is mounted to the system via a quick disconnect assembly to permit easy removal for cleaning, service, and calibration.

The effluent flow is measured using an open channel flow-monitoring device as required by local regulating authorities. The ultrasonic flow meter utilizes a 45-degree V-notch weir. The height of water in the V-Notch weir correlates mathematically with the flow rate through the system. Accurate measurement of this water level yields accurate flow readings. The ultrasonic level monitor measures the height of the water in weir and it is communicated to the system's programmable logic controller, where the height reading is mathematically translated into a flow rate. In addition, we have redundancy in flow monitoring via a manometer and two rotameters.

Each neutralization tank has a reinforced ½" thick bolt down cover assembly sealed with a gasket. The mixers are mounted to each tank using a welded bridge mount assembly to support the full weight of the mixer without relying on support from the cover of the storage tank. The mixer shaft enters the tank via a gasketed assembly to seal the tank. A flanged vent fitting is furnished with each pH neutralization tank. This vent fitting is connected to an acid resistant line and vented to the outside of the building so that the system may properly vent.

The pH reading in each neutralization tank, the effluent pH, and the effluent flow are recorded on a paperless digital recorder. This recorder displays and records data for all points simultaneously in real time. The recorder displays these readings and also permanently saves these readings to a data card.

The pH neutralization system utilizes 25% sodium hydroxide and 10% sulfuric acid as neutralizing chemicals. In order to prevent fluctuating pH values, a 5% sodium bicarbonate solution is continuously metered into the first neutralization tank and serves as a buffering agent.

To prevent non-compliant wastewater from being discharged to the sewerage system, the IWTS is equipped with a pH alarm system that automatically performs the following functions when the discharged wastewater approaches a pH outside of the acceptable range:

1. Terminates the wastewater flow by deactivating the wastewater transfer pumps,
2. Sends a pH alarm page to all IWTS operators so they can respond to the system to identify and correct the problem that has caused the pH excursion, and
3. Allows for the reactivation of the transfer pumps when the pH goes back within the acceptable range.

At least one IWTS operations staff is available at all times to respond to the facility during an alarm condition. Additionally, an emergency contract exists with the IWTS design/build firm to provide 24/7 response if contacted by an Entegris employee.